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COMPARATIVE ANALYSIS OF ELASTIC-PLASTIC PROCESSES AT COMPLEX ACTIVE LOADING AND LOADING WITH UNLOADING

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In the article, there are the results of comparative analysis of phenomenon of delay of vector and scalar properties for paths of active loading and paths with unloading during elastic-plastic deformation. An attempt has been made to classify broken paths of active loading by extracting from them those in which fractures do not significantly affect the appearance of the process image and can be equated to simple loading and those where such simplification is unacceptable.

The simplest type of complex loading is two-link paths with fracture angle in the ranges: (0-90 °) - active loading and (90-180 °) - paths with unloading [1], [2], [6], [8]. The researched broken paths can be considered as a set of several two-link paths [3], [4]. The results of comparative analysis of experimental studies of two-link and polygonal paths are presented below.

Trajectories with unloadings. Experimental study of loading process for deformation paths in the form of two-link broken ones with change of angle at fracture point from 90 to 180 ° is considered. On tubular stainless steel samples, the lag of vector and scalar properties was investigated. The path fan is shown in Figure 1.

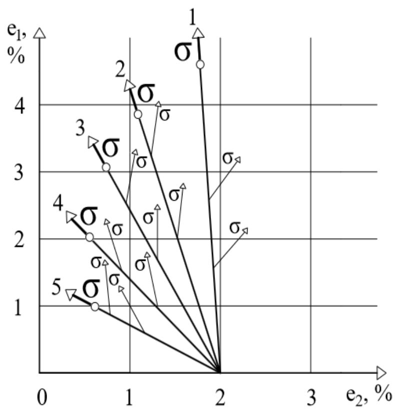

Figure 1. – Beep of paths with unloading

Graphs are obtained for dependence of approach angles on increment of trajectory length counted from a break point [3]. It has been found that as the fracture angle increases, the length of the delay trace of the vector properties decreases and the length of the delay trace of the scalar properties increases (Fig.2).

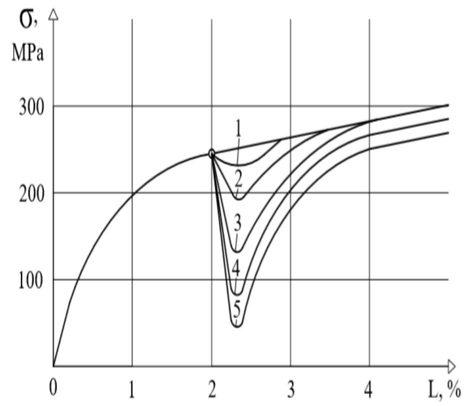

Figure 2. – Response functions for offloaded paths

Quantitative changes in the length of the lag trace of the vector and scalar properties are shown in the Table 1.

Table 1

Break corner	$\lambda_{в}$, %	λ_{c} , %
90°	1,8	0,2
110°	1,6	0,4
125°	1,3	0,8
145°	1,0	∞
160°	0,45	∞

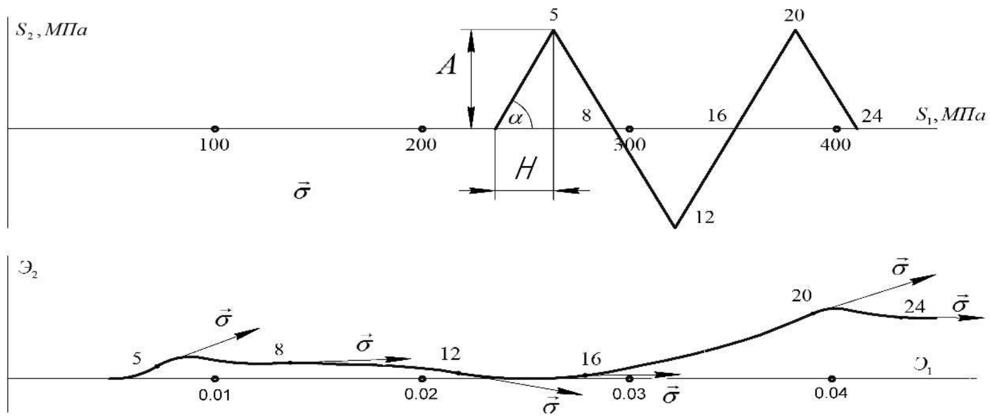

Figure 3. - Loading and deformation paths at torsion reversal

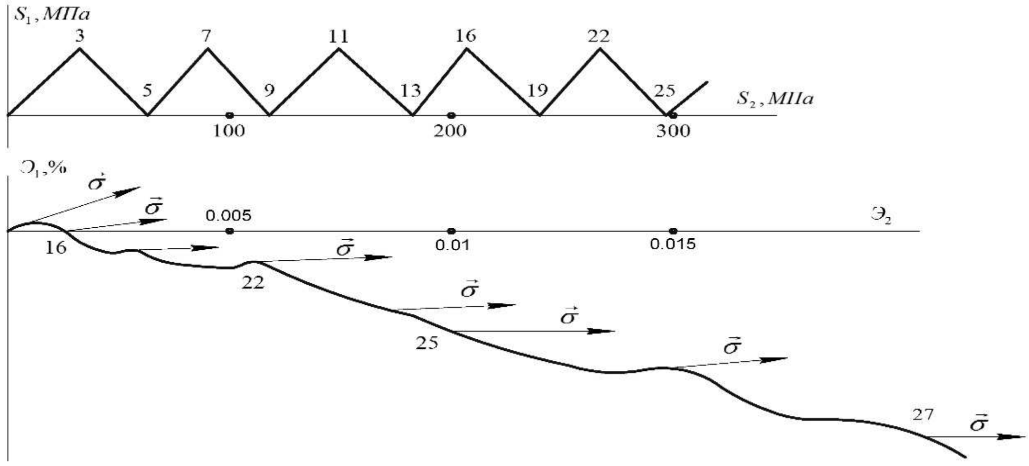

Figure 4. - Loading and deformation paths without torsion reversal

Polygonal trajectories. An alternative set of paths are polygonal loading paths, examples of which are shown in Figures 3 and 4. Here we have A/H- parameter difficulties. Two types of paths are considered: reversed and without torsion reversal [7]. The figures show the respective strain paths. It can be seen from the figures that on the paths having a reverse, the delay trace of vector properties is exhausted (the voltage vector passes the path), which is not observed on the zero paths. Therefore, deformation along these paths is complex, and along track ways reversed - close to simple. Changing the complexity parameter does not violate this trend. Thus, reversed paths with a sufficient degree of accuracy can be classified as simple. This conclusion is confirmed by the analysis of scalar properties: the points of the response function curve [5] of reversed paths lie near the simple loading curve, and the same curves of zero paths are located further. In addition, these curves show notable failures which are characteristic of offloading paths, discussed above. This fact allows us to classify them as "quasi-loading" paths.

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